

REMARKS/ARGUMENTS

Favorable reconsideration of the present application is respectfully requested.

Claim 3 has been amended to recite the controller in “means plus function” format, the control means having the function of controlling the first through third rotary driving devices such that the first and second rotary driving devices rotate the rotary table and the rotary base respectively in such a manner that a tool axis direction of said haling tool is substantially coincided with a normal direction of said machined surface, and the third rotary driving device rotates the tool holder in such a manner that a front rake surface of the haling tool is substantially directed perpendicular to a feeding direction of the haling tool.

The claimed invention is directed to a hale machining method and apparatus. Hale machining is described in the paragraph bridging pages 1 and 2 of the present specification and involves a haling tool whose axis is maintained substantially in a normal direction to the surface to be machined. However, when machining a three-dimensional curved surface the control of the haling machine has become problematic because the known machine is not provided with mechanical means to swing or rotate the workpiece or haling tool around the “A” axis parallel to the “X” axis. Therefore, the known machine cannot hale machine three-dimensional surfaces while maintaining the front rake surface of the haling tool substantially perpendicular to the cutting feed direction F (Figure 1).

In accordance with the claimed invention, on the other hand, referring to the non-limiting embodiment of the figures, a haling tool 34 is mounted to a tool holder 32 mounted to a rotary base 24 which is rotatable around an axis C perpendicular to a first axis B of a rotating table 16 and a second axis A of a rotary base 24. Therefore, the haling tool can not only be straightly moved for hale machining, but also the rotary table 16 and rotary base 24 can be rotated in such a manner that the tool axis is maintained substantially coincident with the normal direction of the machine surface, and the tool holder 32 can be rotated in such a

manner that the front rake surface of the haling tool 34 is substantially directed perpendicular to the feeding direction of the haling tool (paragraph bridging pages 8-9). Therefore, even a three-dimensional curved surface can be accurately machined by the haling tool.

Claims 1-5 were rejected under 35 U.S.C. § 103 as being obvious over U.S. patent 4,833,764 (Muller) in view of U.S. patent 5,630,747 (Haller). This rejection is respectfully traversed.

Muller does not disclose a haling machine but instead discloses a program controlled machine tool having a plurality of working units provided with spindle sleeves 54 respectively bearing a milling tool 56₁, a measuring sensor 56₂, a grinding wheel 56₃ and a drill bit 56₄ (column 5, lines 39-42). The tools on the various working units are chosen and configured that such that different working operations can be carried out on the workpiece.

As the Examiner has evidently recognized, Muller fails to explicitly disclose a tool provided for hale machining. Thus each of the milling tool 56₁, grinding wheel 56₃ and drill bit 56₄ machines a workpiece by rotating the tool at high speed about its rotational axis. That is, the program controls for the respective tools of Muller rotate the tools without regard to the feed direction. Therefore, with respect to Claim 1, Muller lacks an explicit disclosure of "setting a haling tool on said tool holder," or a step of rotating a rotary table and a rotary base in such a manner that a tool axis direction of a non-existent "haling tool" is substantially coincided with a normal direction of a machined surface. Moreover, Muller would not teach rotating the tool holder "in such a manner that a front rake surface" of the non-existent haling tool "is substantially directed in perpendicular to a feeding direction of said haling tool." Instead, the spindles 54 rotate milling, grinding and drilling tools at high speed without regard to the feeding direction of the tool.

Similarly, with respect to Claim 3, the control means for controlling the working units and spindles in Muller would not provide control such that the tool axis is substantially

coincided with a normal direction of the machined surface and such that a front rake surface of a haling tool is substantially directed perpendicular to a feeding direction of the haling tool.

The Office Action asserts that a hale machining tool and process is nonetheless inherent or obvious in Muller based upon the description in lines 13-16 of column 9: "it is possible to operate with different tools, e.g., grinding rods, tapping tools, and laser tools." However, it is respectfully submitted that this description does not inherently teach or render obvious the use of a haling tool in Muller, or rotating the working units of Muller such that a front rake surface of a haling tool is substantially directed perpendicular to a feeding direction of the haling tool. This is because there is no disclosure that any of the grinding rods, tapping tools or laser tools should function by maintaining a front rake surface of the respective tool substantially perpendicular to a feeding direction thereof. Indeed, grinding and tapping tools will normally operate by rotating without regard to the feeding direction, and a laser beam does not have a "rake surface." Thus while the Examiner is correct that Muller "teaches that it is possible to operate with different tools," the enumerated tools do not require or suggest maintaining a front rake surface of the tool substantially perpendicular to a feeding direction, and so the noted disclosure would not teach or suggest this feature of the claims.

Haller was cited to teach a cutting point of a tool maintained substantially coincident with a first rotational axis. However, whatever teaching Haller may have in this respect, it fails to suggest using or controlling Muller such that a front rake surface of a haling tool is maintained substantially perpendicular to a feeding direction or the tool, and so the claims are believed to define over any combination of the above references.

Claim 6 further recites the fourth rotational axis. The Examiner has cited U.S. patent 6,039,634 to suggest providing a fourth rotational axis in Muller. However, whatever

teaching Bach et al may have in this respect, it would not suggest a hale machining method in Muller, and so the claims define over any combination of the above references.

Applicants therefore believe that the present application is in a condition for allowance and respectfully solicit an early Notice of Allowability.

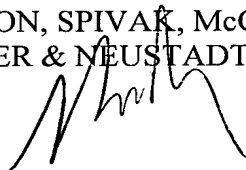
Respectfully submitted,

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